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AN INVESTIGATION INTO THE PREVALENCE OF ENDEMIC
GOITRE IN FAULDHOUSE AND NEIGHBOURHOOD.

Thesis for the degree of M.D.

by

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PRELIMINARY.

During a residence of almost nine years in Fauldhouse, Linlithgowshire, I have been surprised at the number of cases of Goitre cropping up from time to time, both in males and females. Recently I have been struck with its prevalence among young children, and the following case was the chief factor in leading me on to the discovery of this exceptional number among young people, at any rate for Scotland.

About two years ago, I was called to see a young girl, Bella Thomson, aet 12, and residing in a small hamlet, East Benhar. She was complaining of marked shortness of breath, as her mother put it. On examination I found a well marked tumour embracing both lobes and the isthmus of her thyroid and of the parenchymatous variety. I ordered her to see Mr. Stiles at the Sick Children's Hospital. He advised no operative treatment, but recommended rest and gave instructions for her to come back to hospital if it became troublesome. Last Autumn I was called to see her again; her thyroid had swollen considerably in the/

the interval, and on account of severe attacks of dyspnoea, she was unable to continue at domestic service. Being too old for the Sick Children's Hospital on this occasion she was sent to the Royal Infirmary, where she was kept in bed for three weeks and treated with Iodine, both externally and internally, on which she greatly improved.

My reason for giving these details is that through inquiring into this case I found that Goitre was very common among children in this hamlet. In Bella Thomson's family alone, I found eight cases of marked thyroid enlargement, and after some searching discovered thirty cases of Goitre in this small village which has a population approaching four hundred.

The largest centre where these cases of Goitre exist is a mining village, named Fauldhouse. It is situated midway between Edinburgh and Glasgow and is perched on the eastern side, close to the summit, of a part of the Forth and Clyde Watershed. It is about eight hundred and fifty feet above sea level. The inhabitants are chiefly of the mining and quarrying/

quarrying class. The climate is cold and backward; vegetation being at least fourteen days later than that lower down. The soil is damp, consisting chiefly of clay with scattered areas of wild moorland. There are being worked at present various seams of coal, sand, and limestone. Years ago Ironstone Mining was the leading industry. The water supply comes from an artificial lake, six miles away and is of recent introduction. Previous to this supply the village derived its water from a deep well situated about a mile to the south, at a place called Levenseat.

Associated with Fauldhouse, are three mining hamlets, viz., East Benhar to the North West; Longridge to the North East; and Levenseat to the south.

East Benhar is a small mining village, consisting of four hundred inhabitants, situated about nine hundred feet above the sea level. It is a wind swept, bleak place, surrounded on all sides by marshy moorland, and spent bings from old ironstone workings. For years, this village was the centre for working one of the finest house coals ever found in Scotland, namely, the Benhar Virtue-ell. The surrounding moorland/

moorland is still dotted with pits, working seams of an inferior quality.

The water supply is a purely surface one collected into a tank from the surrounding moorland, and then pumped by a windmill to a reservoir, situated in the centre of the village. Before the water reaches the collecting tank, it percolates through an old ironstone bing and then over ground, which was once the site of a large ironstone hearth. On this spot many years ago, seven or eight thousand tons of ironstone and coal were mixed, and allowed to burn until the ironstone was thoroughly charred.

Between seven and eight per cent of the inhabitants drinking this water suffer from well marked goitre.

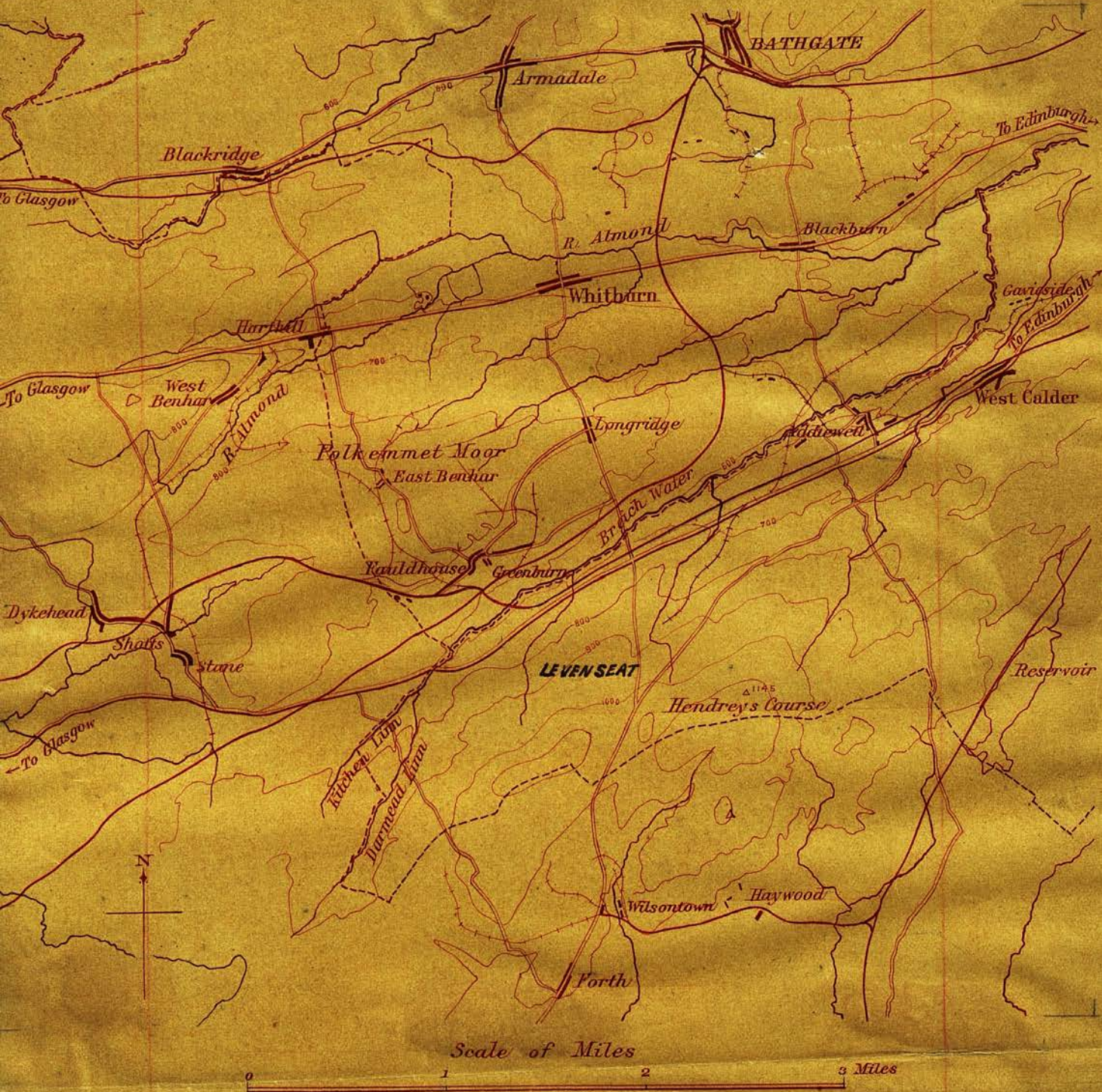
Levensseat is a small village to the south of Fauldhouse, consisting of one hundred inhabitants, and situated nine hundred feet above the sea level. The chief industry is lime and sandstone working, of which there are large deposits in the district.

The water supply comes from a deep spring which formerly supplied the larger village of Fauldhouse.

Longridge/

Longridge is a small village slightly to the North East of Fauldhouse and is about eight hundred and fifty feet above the sea level. This village with its prominent church spire is a striking feature in the landscape. In the manse of this church was born many years ago, Dr. John Brown, of Haddington, the author of "Rab and His Friends". This hamlet possesses no native cases of Goitre, but there are two very interesting cases of imported Goitre, namely, Mrs Darling and Mrs Menzies, shown in Plate I. The one being an extremely large tumour, the other, the calcified tumour of a very old woman.

The above will, I hope, give some idea of the district which possesses sixty cases of Goitre and confined to a district having a radius of less than two miles.



COMPARISON WITH OTHER PARTS OF SCOTLAND.

Recognising that Goitre is not a very common disease in Scotland and especially confined in such numbers to such a small area, I have corresponded with a large number of medical men so as to arrive at a comparison with other parts of Scotland. In the first place I communicated with neighbouring practitioners and found with one exception they had not very much ordinary Goitre. The adjoining town of Shotts, three times the size of Fauldhouse, according to Dr. McMillan, has very few cases. He has only seen four endemic Goitres in eight years, but has treated eight cases of the exophthalmic type in the same period. Dr. Kirke, of Bathgate, has at present very little ordinary goitre, and considers he has seen twenty six cases altogether spread over a period of over twenty years practice. Dr. Young, of West Calder, which lies to the east of Fauldhouse, has had very little experience of endemic Goitre.

Dr. Reid, of the village Forth, and Wilsontown, which lie to the south, has twelve cases, eleven females and one male.

I then went further afield and made inquiries into/

into the coal districts of Scotland. Dr. Wilson, M.O.H., for Lanarkshire, informs me he has seen or heard very little of Goitre. His position gives him special facilities for observing it in children in the large fever hospitals in that county. But very few cases have come his way.

Dr. McVail, M.O.H., for Stirling and Dumbarton Shires has not seen much of it, remarking however, that the Medical Inspector in his Annual Report for 1910 mentions eight cases in his district.

Dr. Macewen, M.O.H., for Fife was very interested in my cases, having resided for some time in a well marked Goitre district in Cumberland where he was investigating the subject. He has not heard of Goitre being prevalent in Fife in exceptional numbers. But from personal inquiries made among people who have resided in the coal districts in Fife, it appears that Goitre is fairly common in several parts of this county.

Dr. Buchanan, M.O.H., Haddingtonshire, reports very little Goitre in his district and certainly not marked in the coal bearing area.

Dr. Oliver, M.O.H., Roxburghshire is the only M.O.H. who has heard anything of marked Goitre in his district/

district. He states that near Yetholm, (the famous village of the Border Gypsies), in the valley of a small stream called the Bowmont, Goitre is common. I wrote to Dr. Rodger of Yetholm regarding this statement, and he informs me that Goitre is not at all common as far as he knows, having only met with eight or nine cases over a period of fifteen years.

Dr. McDonald, M.O.H. for the County of Inverness, reports that Goitre is a rare disease in the Highlands. This is backed up by a statement I have read in Mr. Berry's book on Diseases of the Thyroid.

Dr. McNeil, M.O.H. for Argyleshire has heard nothing of Goitre in his county.

Dr. Dawson, M.O.H. for Galloway writes to me stating that he is not conversant with any cases in his three counties.

Dr. Jardine, who is Medical Inspector for school children in Midlothian and Peeblesshire has only met with two cases among children in his whole area.

I have heard from time to time that Goitre was prevalent in the Lead Hills district and to satisfy my curiosity at this time I wrote to Dr. Ramsay who practices there. He states that in one thousand inhabitants resident in that district there is not a single/

single case of Goitre.

Professor Hunter Stewart to whom I wrote regarding the prevalence of Goitre states that it cannot be looked upon as a common disease in Scotland.

In reading articles on Goitre in the Edinburgh Obstetrical Society's Transactions, I find in a paper read by Sir Halliday Croom the statement that in fifteen thousand cases, taken from the records of the Maternity Hospital, there is only mention of one case of Goitre.

The last communication I had regarding Goitre in other parts of Scotland, was from Dr. Barr, who practices in the town of Carluke. In his valuable and interesting letter, he speaks of Goitre being a common disease in that district forty years ago, but that now owing, as he says, to a change in the Water Supply, it is dying out, and is found only in the older inhabitants.

From the above correspondence I am satisfied that there is in this district an exceptional number of the population suffering from enlarged thyroids; that a number of the cases are of old standing, but that the majority are of recent origin and that these might come under the category of Epidemic Goitre.

In commencing an investigation into this subject, I asked myself the following question. Why should Goitre be so prevalent in this neighbourhood as compared with other parts of Scotland? And secondly, What is peculiar to this district and say, for example, to Derbyshire?

The Geologist backed up by Kocher and Bircher, at once inform you it is due to the underlying strata. In Derbyshire, the great Goitrous bearing strata, is the Carboniferous Limestone. In this district we have all the representatives of the Carboniferous System which includes the Coal measures, the Carboniferous Limestone, and Millstone Grit.

According to Bircher, Goitre occurs only upon marine deposits, especially on the marine deposits of the Palaeozoic, Triassic, and Tertiary Periods. Free from Goitre you have eruptive rocks, crystalline rocks of the Archaean Group, and the sediments of the Jurassic, Cretaceous, and Post-tertiary seas, as well as fresh water deposits. With the above classification, Kocher of Berne, agrees, although quoting one or two exceptions.

To further my knowledge on this subject, and to determine/

determine whether the Fauldhouse strata fell within the above category, I communicated with Sir Archibald Geikie. He very kindly referred me to Dr. Horne, F.R.S., of the Geological Survey, from whom I learnt that the strata underlying Fauldhouse and neighbourhood belonged to the Palaeozoic Period. Properly speaking it is a great subdivision known as the Carboniferous System which forms the strata and which is again divided into three layers comprising the Coal measures, the Carboniferous Limestone, and the Millstone Grit. The details of their arrangement and distribution is explained in the following report for which I am indebted to Dr. Horne.

DR. HORNE'S REPORT:-

The strata underlying Fauldhouse and the surrounding district belong to the Carboniferous System. The village itself rests on the Coal Measures, which is the highest division of this system, and of great economic importance owing to the occurrence in it of valuable seams of coal and ironstone. The members of this group near Fauldhouse, form/

form part of the extensive area of coal measures in Lanarkshire stretching far to the west and north. Eastwards, the boundary of this system is marked by a sinuous line running along the Kitchen Linn to Greenburn, (See Map accompanying Photographic Plates), thence vive to Longridge and northwards by Ravestone House to Polkemmet. The strata consist of Sandstones, Shales, Coals, with occasional marine bands. They indicate land lagoons, estuarine, and marine conditions.

Beyond the eastern limit of the Coal Measures at Fauldhouse there is a narrow belt of Millestone Grit stretching from the Gladsmuir Hills in the south to Braehead on the Breich Water, and to East Longridge and Whitburn in the north. This is a subdivision of the Carboniferous System. The division immediately underlies the coal measures and consists of Sandstones, Fireclays, with bands of Ironstone.

East of this belt there is a development of the Carboniferous Limestone series, stretching from Bathgate, south by Stoneyburn, to Hendry's Course. This series lies underneath the Millstone Grit and is characterised by beds of Marine Limestone, Sandstones, Shales, Coals, and Ironstone.

The/

The Carboniferous Rocks are overlain by a widespread covering of Boulder Clay, damp and retentive, and to the north there is a more or less deposit of Peat.

From the above report it is not surprising to find Endemic Goitre in this neighbourhood, seeing that its rocks fall within the accepted classification of Goitrous bearing Strata.

I may state that Dr. Horne was very interested to hear of the number of my cases suggesting to my mind that by the co-operation of Geologists we have added considerably to our knowledge of this obscure subject. He mentioned in one of his reports to me that in the "Revue General Des Sciences" for September 1910, Dr. Repin (a well-known authority) contends that Goitre is limited to regions where recent fractures in the earth's crust allow deep seated waters to reach the surface, and that people drinking these waters ultimately suffer from enlarged thyroids. In studying the water supply of this district as to its source, etc., one cannot accept the above statement.

Having discussed the geological aspect, one passes/

passes on to what is accepted as the most important factor in the Aetiology of Goitre, namely, the Water Supply, which in the majority of instances drains through a portion of the underlying strata.

THE WATER SUPPLY OF THE DISTRICT.

From the earliest days of the known existence of Goitre, water has been associated with its prevalence, and a variety of its contents have been advanced from time to time as the producing factor. The salts of lime, magnesia, and iron have had their day. They are all now discarded and the more recent view is, on the authority of certain prominent investigators, the organismal one. But as yet no specific germ has been separated from the large numbers found in any water supply.

Captain McCarrison writing in the Medical and Chirurgical Journal, 1906, advances the Germ Theory after a minute investigation into the large number of cases found in the Chitral and Gilgit Valleys. In order to make his theory fit in with the extremely hard/

hard water which prevails in that neighbourhood, he lays down the condition that for the propagation of the organisms causing goitre you must have a suitable calcareous water, just as in Malaria you require a marshy soil for the propagation of its protozoa.

In making inquiries into the history of the Fauldhouse water one is struck by the variety of supplies which have been in use in this neighbourhood during the last fifty years. Before the advent of a recognised supply for the village, people wandered all over the moorland in quest of water, carrying the pails in the manner shown in Plate IV. These well waters varied considerably in their constituents, some being soft, while others were extremely hard.

The following is an analysis of a water issuing from an old limestone mine which I secured from the Local Public Health Authorities and which was carried out by the late Dr. Ivison Macadam. It shows the great variation in the waters of this district when you compare it with the Levensseat water which is collected from a deep spring less than a mile to the east.

ANALYSIS OF MINE WATER.Grains per Imperial Gallon.

Saline Matter	57.92
Organic and Volatile Matter	<u>5.92</u>
Total Solid Matter	<u>63.84</u>

Matter thrown out of solution on boiling	25.52
Nitrates and Nitrites	none
Chlorine	0.68
Common Salt	1.12

Per million parts.

Saline Ammonia	0.01
Albuminoid Ammonia	0.03

As received this water was clear with a slight amount of solid matter in suspension. The results show a very hard water, containing not only a large amount of Carbonate of Lime and Magnesia, but also considerable proportions of Sulphate of Lime and Magnesia in solution.

There is no evidence of actual polluting matter but there will be considerable difficulty in either washing or cooking with this water.

(Signed) W. Ivison Macadam,

County Analyst.

About forty years ago a regular supply was introduced from the neighbourhood of Levenseat. This is a water of good quality and is not so hard as one would expect from its surroundings. Nine years ago this supply was lost to the village owing to a dispute with a local proprietor, and the present water comes from a lake six miles off by means of a pumping station; it is collected into a reservoir situated on the high ground to the north east of the village and finds its way thereto by gravitation. It is known as the Forrestburn Water.

The following are the analyses of these two waters. The one known as the Levenseat Water which at one time supplied Fauldhouse, but now only supplies the village of that name; the other, known as the Forrestburn Water, now supplies Fauldhouse and the village of Longridge.

ANALYSIS OF LEVENSEAT WATER.

	Parts per 100,000.	Grains per Gallon.
Chlorine	1.2	0.84
Nitrites	Absent.	Absent.
Nitrates	Trace.	Trace.
Hardness (in terms of Ca CO ₃)		
" Permanent	3.9	2.73
" Temporary	2.0	1.4
" Total	5.9	4.13
Oxygen Consumed		
" " in 20 minutes.	0.1072	0.075
" " in 3 hours.	0.1496	0.1047
Ammonia		
" Free or Saline.	Trace.	Trace.
" Albuminoid.	0.008	0.0056
Total solids in solution		
" ,Mineral or fixed	2.4	1.68
" ,Organic or Volatile	4.4	3.08
" ,Total	6.8	4.76

ANALYSIS OF FORRESTBURN WATER.

Results expressed in Terms of Grains per Gallon.

Total Solid Residue	4.80
Consisting of Volatile Residue	1.92
And Saline Residue	2.88
Containing Chlorine	0.64
Phosphoric acid	None.
Iron oxide	Distinct Traces.
Nitrates	Faint Trace.
Nitrites	None.
Saline Ammonia	0.0032
Albuminoid Ammonia	0.0144

This is a soft moorland water possessing a faintly acid reaction and like most waters of its class it contains a somewhat high albuminoid rate. The albuminoid ammonia is however derived from Vegetable Matter and is not therefore of much significance seeing that there are no other condemning features.

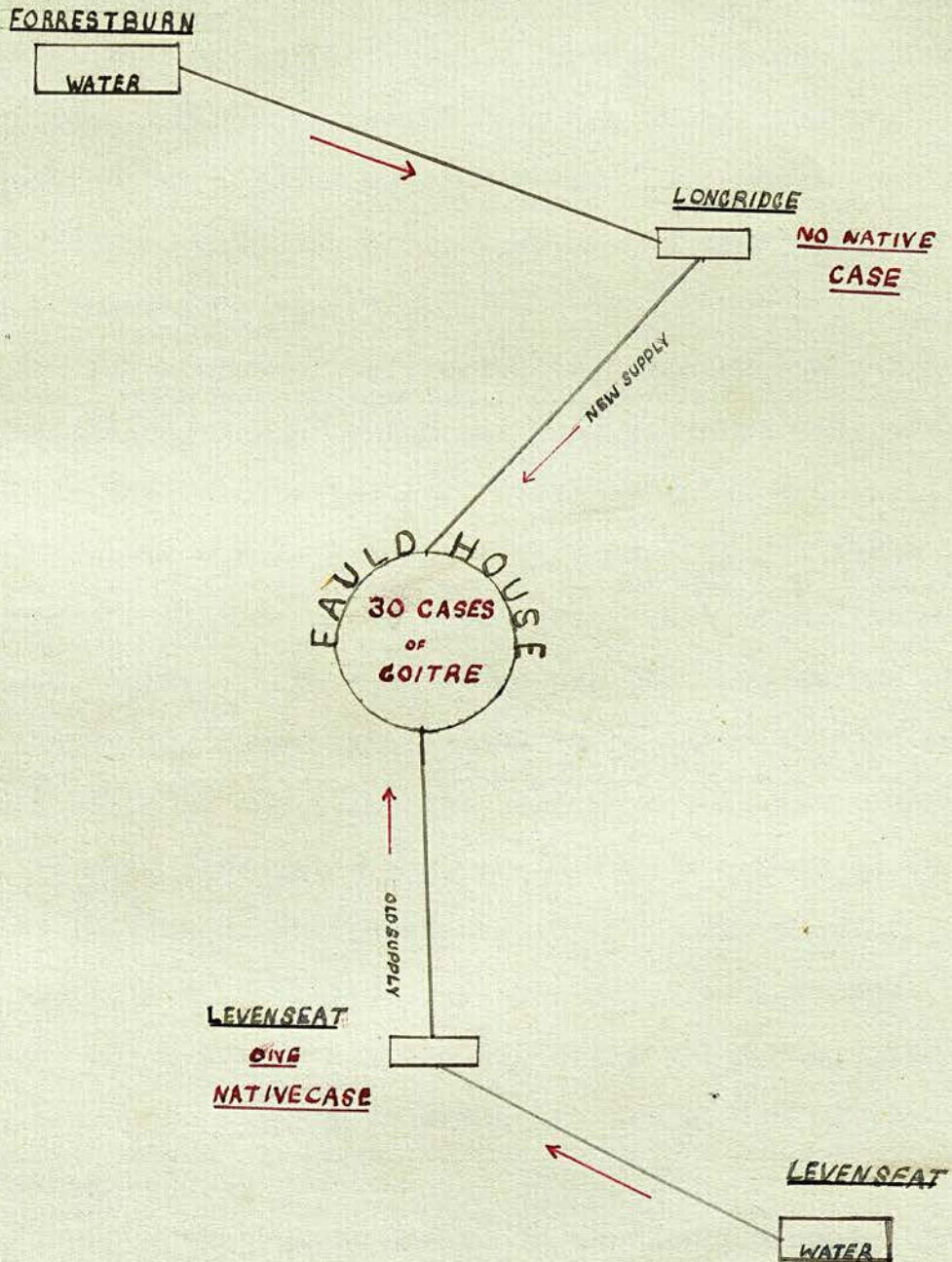
From the foregoing analytical results one observes that the two Waters are not hard, but may be properly designated soft waters, which is an unusual feature in the water supply of a district where endemic Goitre prevails.

There are at present thirty individuals suffering from Goitre who have daily drunk one or other of the above waters. The little village of Levensseat has only four of these cases which works out about four per cent of its total population. Three of the cases belong to one family of the name Timmons, of whom one is the mother who came to the district thirty years ago suffering from an enlarged thyroid which she states was due to working in a stooping attitude at the looms in a cotton mill in Lancashire. This leaves only one true native case in the village; hence one must argue that this water which is still supplying the hamlet and up to nine years ago supplied Fauldhouse is not an active goitrous water.

Secondly the present Fauldhouse water, namely, Forrestburn, cannot be said to be goitrous, as the hamlet of Longridge is supplied with this water which has no native case of Goitre. Why then should Fauldhouse/

Fauldhouse have Goitre to the extent it has? If we accept the germ theory one might argue that Levenseat being near the source, the water at this point may contain organisms in such an attenuated condition that they are not sufficiently strong to produce changes in the thyroid at this particular part, but that in its journey to Fauldhouse where at points there will be a certain amount of stagnation, and possible contamination from the pipes, the organisms have an opportunity for multiplying and so producing the consequent phenomena.

Since the introduction of the Forrestburn Water to this district a fair number of fresh cases of Goitre has been observed, but seeing that Longridge with the same water supply has no native case of Goitre one can hardly designate Forrestburn a Goitre producing water. It is just possible that the old pipes, cisterns, and other utensils still retain the poison, and Goitre holds good no matter what water supplies the area.

FAULDHOUSE WATER SUPPLYDIAGRAMATIC SKETCH.

In East Benhar the inhabitants have not had any great variety in their water supply. At one time the village derived its water from one of the pumping stations of a local colliery, but for a considerable number of years the present water has done duty for all domestic purposes.

The source of this water is a somewhat novel one, the description of which has been given already but which may be repeated and recounted in more detail.

It is a purely surface water draining a large area of bogland; from this marshy soil it collects into a stagnant pool which washes the foundations of an old bing consisting of the waste material from a pit where at one time, coal and ironstone were worked. It slowly percolates through this refuse heap on to the remains of what was once an ironstone hearth; from this it soaks its way into a collecting tank over which stands a large windmill, which pumps the water up to a small reservoir in the centre of the village.

From the above, one would certainly come to the conclusion that here you have something tangible to work upon, namely, the old bing and the old ironstone hearth. What/

What possibilities of contamination! as Dr. Horne stated to me in one of his letters, when I mentioned this curious filtering medium.

The analysis showed a fairly pure water, but much harder than the Forrestburn or Levensseat Waters, and with only a small trace of Iron.

Dr. Ritchie, Superintendent of the Royal College of Physicians' Laboratory, Edinburgh, very kindly analysed this water for me, and while out in the district for his samples he was accompanied by Mr. Hodsdon, of the Royal Infirmary, and Dr. Young of the adjoining town of West Calder. I showed them a large number of my cases gathered together for the purpose in the little village school; in three families alone they saw twenty cases of well marked Goitre.

Dr. Ritchie reports to me that this water is a very pure one taking into consideration its surroundings, but with a peculiarity about some of the organisms found in the samples, and which he intends to investigate further.

The number of children affected with Goitre drinking this water is as far as I can learn somewhat remarkable for Scotland. Through the kindness of the headmaster,

headmaster, Mr. McDonald, I made an examination of every child who happened to be in the school on this particular day. There were one hundred and eight children present, eleven of whom suffered from well marked Goitre and other thirty four children had larger thyroids than normal although one could not call them tumours. The majority of the children were natives of the place, but a number were of recent residence, in some of whom was found a slight hypertrophy of the gland. Up till the day I examined those children not an individual was aware of those enlarged thyroids, and the anxiety of the schoolmaster was somewhat relieved when I told him it was not as a rule a serious disease and that his own children did not suffer from the condition. The intelligent inhabitants of this village have all been busy reading their encyclopaedias on the subject, and Goitre, a term unknown in the village six months ago, is now a byword. Any new arrival taking up residence in this village is at once scrutinised by the inquisitive neighbours and if there should be the least suspicion of a fulness of the neck, it is at once reported with alacrity to my assistant or myself.

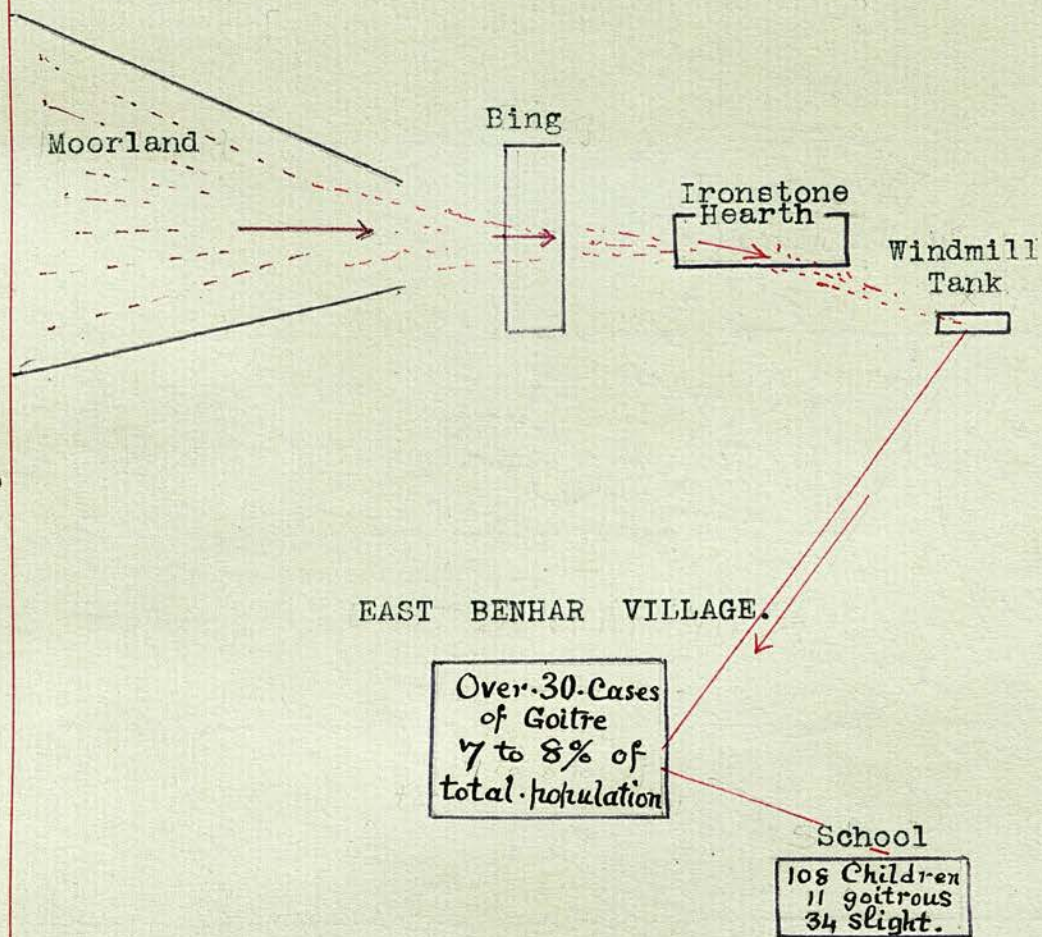
I mention the above to show the interest this condition/

condition has produced in the neighbourhood.

From the analytical examination of those three waters, nothing markedly novel has been discovered. All their various constituents being put out of court as factors in the causation of Goitre, both by the close observation and experimental work of many well known authorities. It is probable that the cause of Goitre, if we are satisfied it is waterborne, will be discovered by some one whose work is confined to the domain of bacteriology.

EAST BENHAR WATER SUPPLY

Diagrammatic Sketch.



ANALYSIS OF EAST BENHAR WATER.

Results of Chemical Examination. Parts per 100,000.

Colour	Clear straw coloured.
Reaction	Alkaline.
Analysis (Parts per hundred thousand)	
Total Solid Residue	17.20
Volatile Residue	3.60
Saline Residue	13.60
Free Ammonia	.0022
Albuminoid Ammonia	.0044
Nitrates	None.
Nitrites	None.
Chlorine	.80
Total Hardness	9.70
Temporary	5.80
Permanent	3.90
Phosphates	None.
Iron	A trace.

RESULT OF BACTERIOLOGICAL EXAMINATION.

Estimation of Numbers of Micro-organisms.

1. Number of colonies developing on agar at 37°C.
Amount of Water used 10 c.c. Result, 5 per c.c.
2. Number of colonies developing on Gelatine at 20° C.
Result, 25 per c.c.
3. Examination for bacteria of the B. Coli group.
Inoculation of Glucose or Lactose Media (M'Conkey).

Amount of water examined.	Result.
50 c.c.	A few bubbles.
30 c.c.	do.
20 c.c.	Acid and Gas.
10 c.c.	0
5 c.c.	Discolouration.
2 c.c.	do.
1 c.c.	0

Biological characters of Suspicious Organisms.

No organisms of B. Coli group grew on Lactose
bile salt agar inoculated from 20 c.c. tube.

HEREDITY.

Having studied the distribution, the geology, and the water supply of the neighbourhood embracing such a large number of the inhabitants suffering from Goitre, and finding such a large number of what one might call family cases, one naturally turns to the hereditary aspect of the question.

Most authorities hold that Goitre is not handed down from father to son but point out in a most convenient manner that there is a hereditary tendency in some people to endemic Goitre.

The most striking example I have of this is in a family named Dungavil. The old mother who died a year ago told me she had Goitre all her days; when I saw her for the first time she had a calcified tumour, the size of a duck's egg, which she proudly stated was a family affair, the same condition occurring in her family as long as she could remember. Her mother and two of her brothers were goitrous; her daughter, now residing in Fauldhouse, who is Mrs Hunter shown in Plate II, has a well marked goitre; her grandchild, daughter of Mrs Hunter also suffers from enlarged thyroid. A son of the old lady, namely Dungavil, shown/

shown in Plate III has a well marked tumour affecting the right lobe of his thyroid, and again in three of his family is the enlargement seen. One member of the family has no enlargement of the gland (shown on the extreme right of the Dungavil group, plate III) but is idiotic, possibly due to some thyroid deficiency. Other two daughters of the old woman are associated with Goitre, one residing a few miles off having a well marked tumour; the other residing in Glasgow is free from any growth but her only daughter has a well marked enlargement.

From the above history one cannot doubt the old woman's statement that swollen necks were a family affair. The old woman was born in the neighbourhood of Biggar, was of powerful physique and never had a moments distress from the swelling.

Another striking case is Mrs Timmons shown in Plate II. She came to the district about thirty years ago from Lancashire, and tells me she had Goitre ever since she worked in the mills there. It is interesting to note that her theory as to its cause, and one which is accepted by most of the mill hands, is due to the stooping position adopted at the looms.

As/

As I mentioned before she has one daughter suffering from a well marked tumour of the thyroid while the only other daughter is free, but whose illegitimate child is goitrous.

There being only one other case in Levenseat apart from the Timmons family, and that case one of Exophthalmos, one is almost justified in holding the view that the daughter and the illegitimate grandchild, suffering from ordinary endemic Goitre, are purely hereditary cases.

Mrs Menzies, shown in Plate I, with the extremely large cystic tumour is the daughter of the old woman, Mrs Darling shown in the same plate. As far as I can find out, in those splendid examples of endemic Goitre, from their family history, the condition begins and ends with them as far as any other relatives are concerned. The old woman states she has had the swelling all her days and has no recollection of any such condition in any of her relatives. Her statement has however to be taken cum grano salis.

There is another family with a strong hereditary taint. Two sisters, a Mrs Chambers and a Mrs Yeardley, both residing in Fauldhouse, suffer from enlarged thyroids/

thyroids. In addition there is another sister residing a few miles off, and to their knowledge two of their mothers aunts were similarly affected, one of whom had an extremely large growth which they say hung down to her breasts.

In the Benhar cases all the mothers, with one exception, are goitrous, but peculiarly enough only one mother had a relative suffering from the condition. The others had never heard of the disease. In one case the grandmother, an old woman approaching eighty, who is shown in the Thomson Group, Plate III, possesses a small goitre, but was unaware of its existence until I pointed it out six months ago. She had never heard of goitre or had she observed any of her friends with swellings in their necks, yet all her son's family numbering eight are goitrous.

In most of my other cases there was no family history whatever, the majority had never heard of the disease and affirm that as far as they know, none of their friends suffer from it.

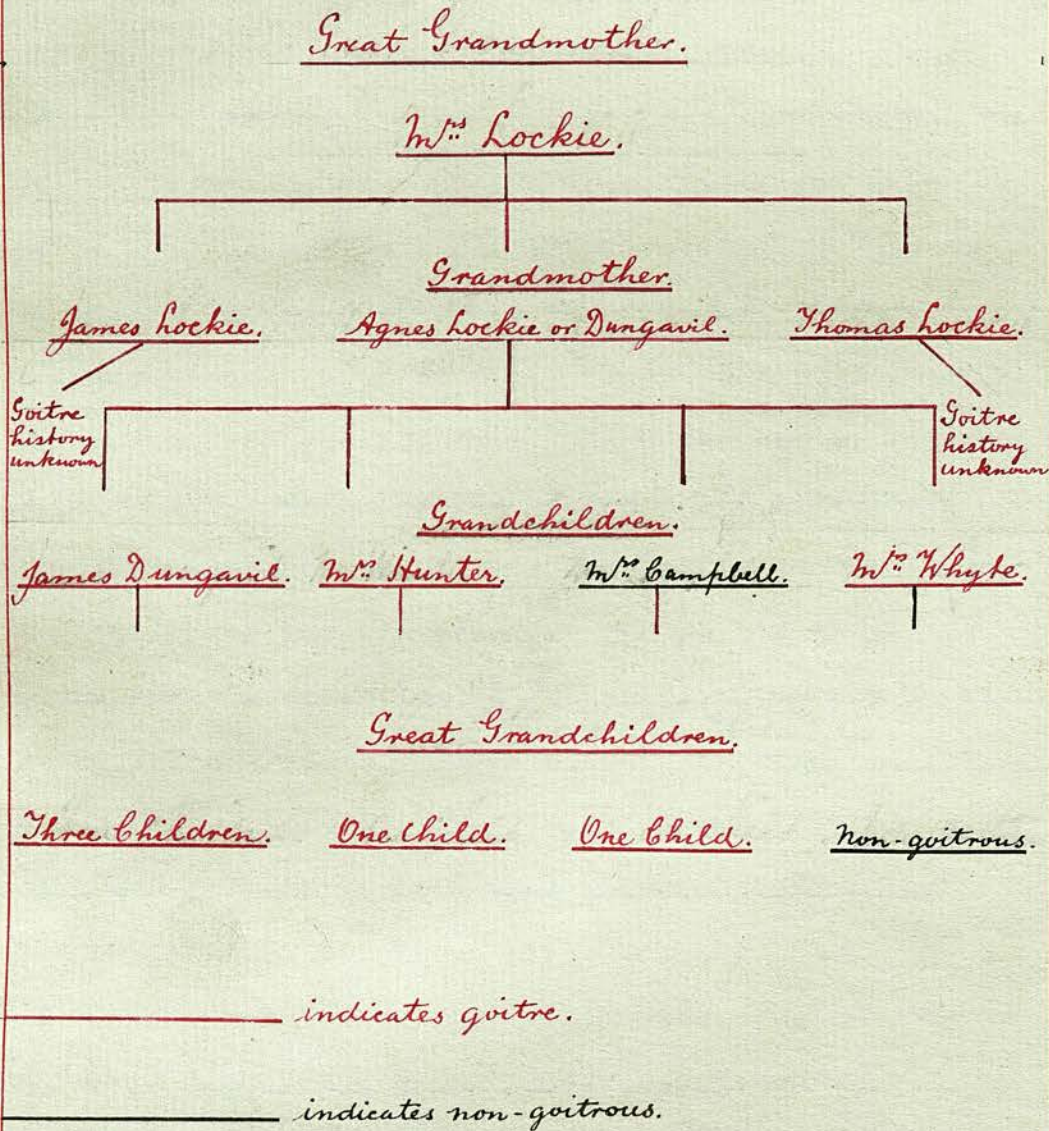
The conclusion one arrives at after full inquiry into the above cases is that in a few there is a marked hereditary tendency, but that in the majority, if their statements are to be accepted as reliable, there is little evidence of such a tendency.

Genealogical Tree

35.

Of Goitre

In Dungavil Family.



AGE.

There is no doubt that age plays an important part in the life of any individual suffering from Goitre. According to many textbooks, adolescence is stated to be the period when this disease in most cases manifests itself for the first time. This may hold good in some districts but does not in this neighbourhood. A third of my cases with well marked tumours are in young people before the age of puberty. From my experience, adolescence and its consequent vital changes, especially in females, produces an exaggeration of the pre-existing Goitre and draws the young woman's attention to the swelling in her neck. As a girl's breasts enlarge at this critical period so does, in my opinion, the enlarged thyroid increase in size and perhaps at this time be recognised as an abnormality for the first time.

We are all aware that the outstanding periods in a female's goitrous life, namely, Adolescence, Pregnancy, and the Menopause, give rise in many instances to distressing symptoms and may result in a tragic ending on the threshold of youth, motherhood, or/

or the termination of her genetic functions.

I have at present several well marked cases representing the troublesome phenomena arising at such periods in the life of a woman with an enlarged thyroid. The first case represents Adolescence.

The young girl Thomson (right of adolescent group, plate V) who though probably suffering from Goitre for years, seeing that all the younger members of the family are affected, was on reaching this period made aware of this swelling in her neck for the first time; and on account of troublesome dyspnoea was unable to remain at domestic service. And yet her two companions, shown in Plate V alongside, both with large goitres suffered no discomfort whatever. One might say that their enlarged thyroids have stolen past adolescence, mayhap to pay the penalty at their first pregnancy.

At pregnancy one has abundant opportunity for studying the variations in goitre. Most goitrous women I have met blame this period for the onset of their tumours. One will tell you it started at the onset of pregnancy, another, during the last months, but most observe it some days after the birth of the child.

It is just possible that goitres at this epoch of the genetic functions are not new, but those which have slipped past puberty and now manifesting themselves for the first time.

When women consult you for enlarged thyroids during pregnancy it is not, as a rule, because of any distressing symptoms, but because the anxious and expectant mother notices the lump in her throat for the first time; or should it be missed by her it is certain to be observed at this period by some inquisitive aged female. There is no doubt that a woman with her first child is particularly alive to the welfare of her body and is acutely observant of any change in its outline. I have a number of women who at this period became aware for the first time of their enlarged thyroids; some of them, immediately after the birth of their child; this in my opinion is probably due to the fact that a hard working woman, who gets a few days rest at this time, has some leisure to think about herself and most important of all, the upper part of her body is usually exposed with the nursing operations. The tumour may produce no troublesome symptoms whatever but there is a decided opportunity/

opportunity for either the mother or her female relatives observing it.

In my experience if Goitre begins to be troublesome at pregnancy it continues to do so at each successive one, so that it gradually increases in size until you get an extremely large tumour towards the end of the genetic period.

Mrs Hunter, shown in Plate II, always gave me a certain amount of anxiety towards the end of pregnancy. Two or three days after the birth of the child her Goitre swelled up considerably and produced very acute dyspnoea. This, what one might call, a Tidal Swelling, appeared to me to coincide with the initial engorgement of the breasts with milk. Which phase luckily for her soon settled down, my treatment being, complete rest in bed for two to three weeks and painting the tumour with strong Liniment of Iodine until a blister was produced.

The last critical period is not considered to be a factor in the causation of Goitre. Most books state that it is seldom observed after the age of forty. It is certainly rare that Goitre is discovered for the first time at this period, it being more/

more commonly the rule for pre-existing Goitres to undergo a more active cystic or calcareous degeneration at the climacteric.

Curiously enough I have met with two women in whom Goitre was observed for the first time at the menopause (Plate IV). One case, a Mrs Clark, has had no trouble whatever from the small tumour in her neck; it is of the retro-sternal variety situated almost behind the upper part of the sternum. It was only possible to get a satisfactory photograph, by snapping it during the act of deglutition.

The second case, Mrs Fisher, Plate IV, was more interesting. As she reached the menopause, severe nervous symptoms manifested themselves, in addition to peculiar seizures which the neighbours described as fits. Not having an opportunity of finding her in any of the above I put the condition down to Hysteria. On one occasion I happened to visit her house just as she recovered from an attack. She complained of shortness of breath and of a lump rising in her throat. Being interested in Goitre at the time my hand went to the thyroid at once, when to my surprise I found low down on the right side of the neck a small hard tumour about/

about the size of a plum. This to my mind was a Retrosternal Goitre giving rise to her dyspnoea. I sent the patient to the Royal Infirmary, Edinburgh, where she had several attacks of the same kind. They agreed that she had a Retrosternal Goitre, but had doubts whether the attacks of apparent dyspnoea were hysterical or due to some interference with respiration. It will be interesting to watch this case for some time.

The only cases I have in females after the menopause are, Mrs Timmons, with the large solid Goitre; the old woman, Mrs Darling, with the calcareous tumour, and Mrs Thomson, with the small cystic thyroid. Those three appear to have slipped past the critical periods of a woman's life, suffering no discomfort whatever.

I may mention that in several of my cases the menstrual flow affects the size of the enlarged thyroid. Time and again I am consulted by Goitrous women due to some dyspnoea at this period. It is a condition of affairs which of itself settles down, assisted occasionally with a little Iodine. Happily I have seen no trouble during labour with these women, but the fact of those tumours lying across their tracheas in cases necessitating chloroform does not conduce to one's peace of mind.

SEX.

According to most Statisticians, Goitre is much more prevalent in females than in males, and this is the case in adult life no doubt, whereas every practitioner has seen a case of Goitre in a female, it is extremely doubtful if many have seen much of Goitre in the male especially in Scotland. In my family cases, in East Benhar, there are almost as many boys affected as girls, and it will be of interest to watch whether those Goitres in the boys, if left untreated, will persist on to manhood. It is agreed that this is a disease which is of much less consequence in the male than in the female, which is just what one would naturally expect; the body of the male not being subject to those outstanding genetic epochs which obtain in the female.

In this district I have almost a dozen and a half males suffering from well marked Goitres, six of whom have entered manhood, three being adults. In no instance has there been any inconvenience from their enlarged thyroids. The tumours have all been discovered by accident, commonly by the unusual measurement of collar required for their particular age. In/

In the old gentleman, shown in Plate IV, the enlargement was noticed for the first time three years ago and that by accident. His case is somewhat interesting. Eighteen months ago, he developed a condition which manifested itself by extreme weakness, a high specific gravity, and sugar in his urine. This looked like an ordinary case of Diabetes, but with rest and careful dieting, sugar disappeared and he became well again. Since that time he has had three attacks of Glycosuria, but no trouble whatever from his Goitre. His urine has a persistently high specific gravity, 1028, or thereby and rises to 1035 with sugar.

I have come across other two cases of Goitre associated with Diabetes, both of whom are now dead. One, was an old woman with a very large Goitre, residing in East Benhar. It is of interest to know that this woman for years kept the local dairy and supplied all the milk to that hamlet. If there was any chance of atmospheric infection in Goitre from an individual to such a susceptible medium as milk, then a unique opportunity afforded itself in this case. Mrs Drylie, shown in Plate IV, with a well marked Goitre/

Goitre is a daughter of this old dairykeeper. The other case was a young man with a very small growth in his thyroid. He developed very acute diabetes and died in two years. As far as I could learn his abnormal thyroid produced no inconvenience.

Mrs Hunter whose urine among others I have examined from time to time, has a high specific gravity, but on no occasion have I found sugar.

The above cases are of interest in view of the opinions held by some investigators regarding some relation between the function of the thyroid gland and the kidneys.

The only abnormality I have observed in my cases of male Goitre, was a marked increase in the size of the tumour of a young man while suffering from an attack of Tonsillitis. There was however no discomfort produced by the said increase. From my experience with those cases in the male, endemic Goitre appears to cause no discomfort whatsoever. I have only been consulted by one out of the whole number, that for no inconvenience but due to the anxiety of his friends at the persistence of the swelling.

Under "Sex" I have only discussed the male subject, as most of this paper deals with Goitre affecting the female.

VARIETY OF TUMOUR.

In the cases affecting young people the type of tumour is as one would expect of the soft parenchymatous nature. In adults you get in some cases also a soft tumour which fills up the whole front of the neck. It is by some, designated the Annular Type and is commonly seen in women during their child bearing period. A number of these cases are shown in the photographic plates. I have, however, several small tumours at this period which develop a cystic formation very early. Why one tumour in a certain individual should become cystic and not in another is difficult of explanation.

In a number of the children affected, the tumour envelopes only one lobe of the gland and most commonly the right, but in some cases the whole gland is involved giving rise to very large tumours as, for example, in the children of Mrs Carty, Plate III. There you see most pronounced Goitres in her three young children and though so large, no untoward symptom has been observed in her family, in fact, she was not aware that her little ones were affected with Goitre until/

until pointed out to her by my assistant, Dr. Gilchrist, a few months ago.

In the majority of my cases the tumours follow the usual classification found in most books on the subject. In adolescence and previous to that period, you have as mentioned before, the soft parenchymatous variety. In adult life you have cysts being formed in such tumours some of which show single and others multiple cysts. It is curious to find a small single cysted tumour in a married woman giving rise to a large measure of respiratory discomfort, while in the huge multiple cystic tumour seen in Plate I there is no discomfort of any kind, but to anyone hearing the latter speak, you at once recognise the brassy voice produced by tracheal compression. This woman had a child eighteen months ago, had no difficulty during the labour, and was in no way inconvenienced by dyspnoea after the birth of the child.

The most interesting tumours to me are the two Retrosternals, discovered at the menopause. They are small, hard Goitres, affecting in both cases the right side, normally tucked away behind the sterno-clavicular joint, and which require the act of deglutition to bring/

bring them prominently before the eye. A very marked and prominent tumour is that of Mrs Timmons. On examination it feels quite solid, involving chiefly the isthmus of the gland; it sits right in front of her trachea, but appears to produce no discomfort whatever. It is undergoing calcareous degeneration and will very probably give her no trouble as long as she lives.

The tumour in the old gentlemen, Plate IV, appears to be a cystic one involving the right lobe of the gland and lying over the large vessels on that side of the neck. It might be classified as belonging to what the books call the pulsating variety of Goitre, as marked pulsation may be felt in it at different times. I am of the opinion, however, that the pulsation is due to the proximity of the tumour to the large vessels running up the side of the neck.

The calcareous type is the last stage of Goitre and a well marked example is seen in the old woman Mrs Darling. (Plate I). It is quite like a stone to the touch, and rolls backwards and forwards over her trachea, giving rise to no discomfort, has never done so/

so and probably never will. One wonders if the baby of twenty months, seen in the Walker group, will if left untreated slip past adolescence, motherhood, and the climacteric to this calcareous stage; I think very unlikely. A case such as this old woman's is an object lesson to us how little is yet known of the functions of the thyroid. Why should this old woman, in whose face there seem many tragedies, slip along with such a tumour, whose life was one struggle against all kind of hardship, a woman who has wandered all over the coal bearing districts of Scotland, carrying a Goitre to which she paid no heed, while others living in the best environment with tumours of exactly the same anatomical situation suffer great distress at various periods of their lives which necessitates in many cases severe operations or prolonged medical treatment. It certainly does not bear out the view held by some authorities that in many cases Goitrous phenomena are the result of anxiety or severe mental strain.

In this district I have only seen three cases of Goitre associated with exophthalmos, two, are in young people, and have ordinary soft swellings in their/

their glands, one was in an old woman seen in Plate I, but on account of the long period since the onset of Graves' Disease, the gland has almost disappeared as is customary in such cases.

In various text-books it is laid down that where endemic Goitre prevails very little exophthalmos is seen, and to bear this point out in this neighbourhood, one Doctor in the town of Shotts has seen eight cases of Graves' Disease with hardly any endemic Goitre, whereas in this district there are sixty cases of endemic Goitre and only three of exophthalmos, only two at present being well marked cases.

I have never seen a case of Myxoedema in this neighbourhood, but there is one child who has a marked tendency to cretinism.

HABITS OF THE PEOPLE.

In a district where there are sixty cases of Goitre and the cause of which is still unknown, it is essential to take note of the customs, etc., of the people in carrying out any investigations.

The most outstanding habit among the working classes of this neighbourhood is the large amount of ordinary cold water consumed by them. The pitcher stands in a niche between the outer and the inner doors. There is usually no covering to it and its surface especially in windy weather is covered by all sorts of refuse carried in by the four winds. This habit of much water drinking is not confined to the males, but every member of the household is a profound water drinker. One is not surprised at this habit among colliers as their work is arduous and produces profuse perspiration while underground, and whose every pore cries out for water on reaching the surface. In many cases those men drink the water which collects in the neighbourhood of their working places; this is an extremely dangerous practice as such a water is markedly contaminated.

Another/

Another point in connection with the above is the large amount of cheap aerated waters which is consumed by the miners and their families. In order to meet this demand the manufacturers produce large bottles of cheap lemonade for the thirsty miners. Great quantities of this beverage are consumed from week to week.

It is a common saying in a miner's village that they would rather see the brewer's cart than the policeman or the doctor.

It is quite possible that if those cheap aerated waters are manufactured from a water which is Goitrous, various isolated cases arising in different neighbourhoods may thus be accounted for.

If Goitre is water borne as most authorities hold then every opportunity is given by the inhabitants of this district to the ingestion of the poison.

Another drinking habit which strikes the stranger is the large amount of sour milk which is consumed. In every miners house you see a large enamelled pail filled to overflowing with this liquid. It is drunk in large quantities, being a splendid thirst quencher to the perspiring colliers. I have often thought it is/



is due to this habit that many of those poor people escape stomach and bowel trouble due to irregular feeding and bad cooking.

A writer has recently advocated the use of sour milk for the prevention and diminution of Goitre. Perhaps it would surprise him to learn of the large quantity of sour milk consumed in this district and yet carrying such an exceptional number of people afflicted with Goitre.

In the little village of East Benhar, you might see on certain days of the week, a dozen women and children waiting their turn around the dairyman's sour milk cart. A large amount of this milk is used for drinking purposes, some of it for baking and the remainder taken with their porridge which on fairly frequent occasions constitutes the miner's dinner after an arduous day's work in the pit.

Another custom, now dying out in this locality with the advent of gravitation water, was the carrying of such water by the young women of the place. Two pails were slung from a horizontal piece of wood which rested on the shoulders; in the centre of this beam was a circular hole open at one part and which embraced the neck/

neck of the young female. If this opening happened to be too small the weight instead of being on the shoulders was taken by the soft structures at the base of the neck.

Books often quote as a possible cause of enlargement of the thyroid the carrying of heavy weights on the head or shoulders.

The local custom just mentioned falls within this category and it is just possible that in this locality where Goitre is fairly rife, the habit may have predisposed to enlargement of the gland or at least may have exaggerated an already existing tumour. The custom still prevails to a small extent.

Overcrowding is a prominent feature of this district, one roomed dwellings being all the vogue among a large number of the inhabitants. There are often as many as ten in such a house packed like sardines in either bed at night.

If Goitre should be a latent infection then it gets full play to propagate its organisms in such surroundings.

Dull times and hardships are not usually classified in the habits of a people, but in mining districts they/

they play an important part in the welfare of the people. Perhaps the mining classes are more subject to the above than any other type of working people. You have your short boom in the coal trade with its prolonged dull period following in its wake. As a rule the average miner lives from hand to mouth and often at the end of the week their food is of the poorest description.

Three years ago this district developed acute depression in its coal producing industry, while five of the important pits were shut down. For two years following this unfortunate circumstance, there was a keen struggle for existence, especially among the poorer miners; and for weeks on end bread, dripping, and weak tea formed the daily menu of these poor people.

There is no doubt that after this period of bare existence, Goitre manifested itself to the marked degree to which it has now risen.

CONCLUSIONS.

From the large amount of correspondence I have had with other men in all parts of Scotland likely to be Goitrous, it is evident that this disease is not a common one or known to be such. This is also the opinion held by the Professor of Public Health in Edinburgh University, also by Mr. Berry of London who perhaps has made more inquiry into the distribution of this disease than any other in this country. Another distinct proof that it is not markedly prevalent is the fact that in the fifteen thousand cases of pregnant women stated by Sir Halliday Croom from the records of the Edinburgh Maternity Hospital, only one case of Goitre was noted. And we all recognise that if any period is selected for the manifestation of Goitre, pregnancy is the leading one.

The only district where Goitre appears to be very common, exclusive of this neighbourhood, is as far as I can learn in and around Carluke. This town and Fauldhouse form the eastern and western boundaries of the bogland covering the carboniferous area in this part of Scotland. This extensive area of peat appears to/

to me to be the stronghold of Endemic Goitre in Scotland. Dr. Barr of Carluke thinks there are still three to four per cent of the inhabitants suffering from this disease in his district. In the Fauldhouse district the average will be much the same as that of Carluke, but taking the hamlet of East Benhar as a separate unit, it will be very much higher. It seems then, that this wild moorland eight miles long with its large deposits of lime stone, possessing all the geological features necessary for endemic Goitre, appears to afflict a large percentage of those living on its cold and barren surface, and also those at a distance who drink the waters draining through its strata.

This disease although so prevalent is practically unknown to the bulk of the inhabitants and certainly causes little anxiety to those suffering from it.

It appears probable that Carluke suffered at one time from Epidemic Goitre, now gradually abating, and that this phase of the disease has now settled on this district being most marked in the little village of East Benhar. In Carluke the water supply was blamed for the disease, and a relative of the doctor suffering/

suffering from it states that all those affected were in the habit of filtering and boiling all the water used for domestic purposes. After a few months of this procedure, a gradual diminution in the size of the tumour was noticed. He also states that before the advent of the present gravitation supply the inhabitants derived their water from draw-wells after draining a large limestone area; the present supply comes from the bogland five miles off and is caught before it reaches this deposit of limestone, therefore it is a much softer water than that contained in the old draw-wells. To this change in the hardness, Dr. Barr attributes the diminution in the disease.

Most authorities would not accept this view as Goitre is found in various districts where a soft water is the rule. The diminution of Goitre in Carluke, coincident with the change of its water supply, supports the theory that there may be some bacteriological cause at work and through the change of supply the inhabitants may now be drinking a water free from this specific organism which may lead to the ultimate disappearance of the disease.

In the Fauldhouse district, it appears to me that
we/

we are at present in a region of epidemic Goitre when we take into consideration the number of young people affected, but that those tumours in the older people are more of the endemic type. It is also certain that Goitre existed in this area, a good many years ago, which the following substantiates.

A few weeks ago I met a middle aged man who told me he suffered from Goitre thirty years ago. From his description it appears to have been a tumour associated with exophthalmos, a condition which the local medical man considered hopeless and the poor fellow made up his mind to die. The Free Church Minister taking a great interest in him advised him to pay a visit to Dr. Joseph Bell at the old Infirmary. This the young man did and in a very short time he was quite well, the treatment being some internal medicine and active blistering over the gland. He also recalled that in the town of Carlisle there lived an old blacksmith who was a recognised authority on the treatment of Goitre, his remedy was also a form of some active blistering liquid. The fact of this old blacksmith having such a reputation proves conclusively the presence of Goitre in that neighbourhood many years ago.

The/

The water supply of Fauldhouse and the adjoining hamlets has been a very varying one. First, you had the moorland draw-wells which showed a marked difference in their analyses. In two, the analysis shows a difference of sixty grains of solid ^{to the gallon} ~~matter~~, though their waters came to the surface within a short distance of each other. From the analysis of the present water supply one can find nothing which can be definitely said to account for the prevalence of this disease or its active spread among children. They can all be classed as good water supplies with a certain amount of variation in the percentage of hardness, East Benhar having the highest. For moorland waters they show very little impurity. It is evident from their analyses that up to the present no separate element can be fixed on as the cause of the disease in this neighbourhood, for the simple reason that other places with water supplies of an almost similar nature show no trace of Goitre among the inhabitants.

If on the other hand we accept the germ theory I can only state that at present there is an excellent opportunity in this district and especially in East Benhar for anyone interested in the bacteriological aspect/

aspect of the question, the prevailing view now being among some of the highest authorities on this disease that the cause of Goitre will be found by workers in this branch of science.

Apart altogether from the question of water supply it is quite evident to anyone approaching this subject that Goitre is a disease having an affinity for certain families, and that almost in every case where I have found a child affected I also discovered the mother or some other near relative suffering from the disease. Why there should be this curious predilection there is no satisfactory reason up to the present, and one can only echo the statement given in many text-books that there is an hereditary tendency in many families.

I am convinced that the great increase in the number of cases of this disease which we know has prevailed for some considerable time, is due to some striking cause. It may be to the more active propagation of some specific organism, this is extremely hypothetical. I think it is more likely to be due to the great change in the mode of living which took place among the inhabitants a year or two ago. Before this time/

time you had the mining classes partaking of a rich dietary, as far as that goes among the working classes. You found large quantities of butcher meat, cheese, butter and eggs being consumed, but on account of the acute depression in the coal trade with its consequent lack of employment, and a shutting down of several of the local coal pits, there was a keen struggle for existence and in place of the substantial diet afore mentioned there was among many, substituted one of the most meagre description.

I hold that this state of semi-hunger, which lasted for a period of eighteen months at least, deprived the blood of many of the essentials necessary for the welfare of those people.

It suggests itself to one attempting to discover a cause for the origin of this remarkable outbreak of Goitre in this neighbourhood, a disease which many hold is due to a lack of iodine in the thyroid secretion, that by this change of diet there was a deficiency in the food supplying the normal amount of iodine forming elements to the gland. The absence of this element resulted in a marked increase in the size of Goitres already existing and produced in many young people, Goitres for the first time. There were in/

in my opinion a fair number of these children with slight hypertrophy of their glands before this abnormal period, just as one finds in the village school at present; and such cases may be put down to some deleterious substance in the water supply.

In my opinion it only required the special circumstances before mentioned, with their lack of sufficient nourishment to cause a sudden reaction in glands already sensitive and by their ultimate apparent enlargement proclaimed to the onlooker the struggle for food which those children had to undergo.

One is struck by the small amount of inconvenience which is produced in the average individual suffering from this disease. I find the only really troublesome period is during the active sexual life in the female. Among the others it is the rule to hear or see little of them. They have no desire for treatment and are annoyed if you pay any undue attention to their disease. My cases being among the working classes and the modern treatment for the relief of this condition being an expensive one, very little opportunity for methodical treatment has presented itself to me. I find strong Liniment of Iodine a valuable/

valuable standby in most of those poor people. In adult women the tidal increases which you get from time to time are soon relieved and returned to their normal sizes by a few paintings with this lotion. In children before the age of adolescence not a single parent has consulted me regarding their child's hypertrophied gland. The only occasion on which I had what might be called a mild boom for treatment among the inhabitants was when the woman Mrs Menzies appeared in the neighbourhood for the first time. There was a gasp of horror among those poor women when she walked past their doors, and which gave them the idea that some day their Goitres might reach the dimensions of this womans.

Although this disease is so prevalent I have not found it adding much to one's daily work or disturbing one's peace of mind.

Finally, I should say that in my opinion there is collected in this small area a larger number of cases of endemic Goitre than in any other place of the same size in Scotland at the present moment, and that there are an unusual number of children affected, that there is brought out in those cases a strong family or hereditary/

hereditary tendency, that the normal endemic Goitre is probably produced by some poison in the water supply, although there is no clear proof in this district, but that the great increase in cases which may be styled Epidemic was probably due to the hardship and struggle for food which the district passed through some time ago.

In addition there is the possibility of direct infection when one thinks that for a number of years the total milk supply of the people in East Benhar village was ladled out by a woman with well marked Goitre.